

# Snehasis Addy

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## Education

### University of Massachusetts-Amherst

Doctor of Philosophy in Computer Science

- **Supervisor:** Prof. Filip Rozpędek; **Co-Supervisor:** Prof. Gayane Vardoyan

Amherst, United States

Sept 2024 - Present

### University of Calgary

Masters of Science in Physics- Thesis based

- **Supervisor:** Prof. Daniel Oblak; **Co-Supervisor:** Prof. Reihaneh Safavi-Naini
- **Courses:** Building a Quantum Computer, Introduction to Quantum Optics, Relativistic Quantum Mechanics, Statistical Physics

Calgary, Canada

Sept 2021 - Apr 2024

### Indian Institute of Technology (ISM), Dhanbad

Bachelors of Technology in Electronics and Communication Engineering

- Graduated with an overall of 8.22/10 GPA.

Dhanbad, India

Sept 2017 - May 2021

## Projects

### Quantum Switch using Quantum Error Correction code

University of Massachusetts-Amherst

- In this we are developing a memory-equipped quantum switch that can distribute multipartite entanglement among  $n$  customers. We are investigating the benefits that quantum error correction techniques within a switch can offer to mitigate operational errors such that the quality of the generated multipartite entanglement is maintained.

Amherst, US

Sept 2024 - Present

### Optimizing resource allocation in a quantum switch using Reinforcement Learning

University of Massachusetts-Amherst

- In this project we are considering the problem of allocating resources within a memory-equipped quantum switch. Using as many local memories as the number of parties  $n$  leads to high gate errors and significant resource overhead. Here we explore protocols making use of  $m < n$  memories leading to a reduction of both number of gates and matter qubits needed at the expense of an increase of the storage time requirement. In this project we perform optimization over this trade-off using RL techniques.

Amherst, US

Sept 2024 - Present

### Entanglement distribution using EPR source following round-robin scheduling

University of Massachusetts-Amherst

- In this project we are considering the problem of distributing bipartite entanglement among  $n$  number of flows (pair of nodes) using high-rate photonic EPR generation source which follows round-robin scheduling. We are considering a node distribution scenario where all of the flows are equidistant and also the scenario where we have nodes which are not equidistant from the source.

Amherst, US

Sept 2024 - Present

### Error Correction in Quantum Key Distribution using Polar Codes

University of Calgary

- Developed an algorithm to find the reliability sequence required to do encoding for arbitrarily long block length in a binary discrete memoryless channel.
- Implemented encoding of polar codes using the generated reliability sequence.
- Implemented decoding of polar codes using successive-cancellation decoding method.
- Calculated the entropy loss and extractable key length.
- Studied working and design of polar codes.
- Worked with high-performance computer clusters.
- **Technical Skills:** programming, security analysis, data analysis, algorithm design, LaTeX.
- **Soft Skills:** time Management, teamwork, presentation skills, report writing.

Calgary, Canada

Sept 2021 - Dec 2023

### Implementation of LDPC Error Correction over Experimental QKD Dataset

University of Calgary

- Implemented LDPC encoding.
- Implemented LDPC decoding using Belief Propagation algorithm on the data set collected from satellite QKD experiments in our group.
- **Technical Skills:** Python, algorithm design.
- **Soft Skills:** presentation skills, leadership, teamwork, logical thinking.

Calgary, Canada

Sept 2021 - Dec 2021

## Skills

**Programming** Proficient in Python, Matlab and C/C++; Proficient in Qiskit ([Certified IBM Qiskit developer](#))

**Miscellaneous** Algorithm design, Information theory and Coding theory, LaTeX, Microsoft Office, Git.

**Platform** Worked on personal computers as well as high-performing computer clusters such as Microsoft's Azure.

**Soft Skills** Time Management, Teamwork, Leadership, Problem-solving, Critical Thinking, Documentation, Scientific Presentation and Writing

## Work Experience

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### University of Massachusetts-Amherst

Teaching Assistant

Amherst, US

Sept 2024 - Present

- **Course: CS 490Q- Quantum Information Science**

- Conducted many office hours to clear many concepts of the students related to the course.
- Managed undergraduate teaching assistants to ensure smooth running of the course.
- Helped the instructor to prepare questions for Exams and prepare solutions.
- **Soft Skills:** time management, leadership, communication skills.

### University of Calgary

Lead Teaching Assistant

Calgary, Canada

Sept 2022 - December 2022

- **Course: PHYS 369- Acoustic, Optics and Radiation**

- Taught students various experiments related to the course and how to do them.
- Managed teaching assistants of several classes.
- Ensured smooth running of the course.
- **Soft Skills:** time management, leadership, communication skills.

### University of Calgary

Teaching Assistant

Calgary, Canada

Jan 2022 - Apr 2022

- **Course: PHYS 259- Electricity and Magnetism**

- Taught various concepts related to electricity and magnetism.
- Ensured smooth running of a class.
- **Soft Skills:** time management, communication.

### University of Calgary

Research Intern

Calgary, Canada

May 2020 - July 2020

- **Project: Error Correction in Quantum Key Distribution using LDPC codes.**

- Designed an algorithm to find the parity check matrix needed to generate syndrome.
- Designed a complete interface to handle error correction (encoding and decoding) in a binary symmetric channel with different error rates.
- Studied error correction using LDPC codes.
- **Technical Skills:** Python, C++, LaTeX, Git.
- **Soft Skills:** time management, scientific writing and verbal communication, presentation skills.

## Publications

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### THESIS

#### **Polar codes for information reconciliation in QKD Quantum security for polarized channels**

Snehasis Addy

available at: [prism.ucalgary.ca](http://prism.ucalgary.ca).

### PAPER

#### **Flexible polar encoding for information reconciliation in QKD**

Snehasis Addy, Sabyasachi Dutta, Somnath Panja, Kunal Dey, Reihaneh Safavi-Naini, and Daniel Oblak

available on arXiv as [arXiv:2312.03100](https://arxiv.org/abs/2312.03100)

## Presentations

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#### **Efficient polar encoding for information reconciliation in QKD**

Poster

College Park, United States

Aug 14-18, 2023

QCRYPT-2023

#### **Efficient polar encoding for information reconciliation in QKD**

Contributed Talk

Edmonton, Canada

July 31- Aug 1, 2023

Quanta CREATE Symposium- 2023

#### **Improved Polar Code Encoder for Quantum Key Distribution**

Poster

Online

Jan 17-19, 2023

Quantum Days- 2023

#### **Error Correction in Quantum Key Distribution using Polar Codes**

Poster

Calgary, Canada

Oct 11-13, 2022

Quantum Alberta Summit- 2022

## Information Reconciliation in Quantum Key Distribution

Contributed Talk

Quanta CREATE Symposium

Edmonton, Canada

Aug 7-9, 2022

## Error Correction in Quantum Key Distribution

Contributed Talk

University of Calgary Physics and Astronomy Symposium

Calgary, Canada

Feb 22, 2022

## Error Correction in Quantum Key Distribution

Contributed Talk

Undergraduate Research in Science Conference of Alberta- 2021

Online

May 3-4, 2021

## Awards and Achievements

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| 2024      | <b>Scholarship</b> , 2024 CICS Scholarship   | United States |
| 2021-2023 | <b>Award</b> , International Graduate Tuition Award                                | Canada        |
| 2023      | <b>Award</b> , University of Calgary PHAS Internal Award                           | Canada        |
| 2022      | <b>Award</b> , University of Calgary PHAS Internal Award                           | Canada        |
| 2021      | <b>2nd Place</b> , Undergraduate Research in Science Conference of Alberta (URSCA) | Canada        |
| 2020      | <b>Award</b> , MITACS Globalink Research Award                                     | Canada        |
| 2017      | <b>99.44 percentile</b> , JEE (Mains) and JEE (Advanced)                           | India         |
| 2017      | <b>Certificate of Excellence</b> , All India Senior School Certificate Examination | India         |
| 2017      | <b>99.9 percentile</b> , Physics and Math in Senior Secondary Examination          | India         |

## Languages

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**English** Bilingual proficiency

**Hindi** Bilingual proficiency

**Bengali** Native proficiency

## References

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### Prof. Filip Rozpedek

Supervisor

**Contact:** [frozpedek@umass.edu](mailto:frozpedek@umass.edu)

University of

Massachusetts-Amherst

Assistant Professor

### Prof. Gayane Vardoyan

Supervisor

**Contact:** [gvardoyan@umass.edu](mailto:gvardoyan@umass.edu)

University of

Massachusetts-Amherst

Assistant Professor